DOCUMENT RESUME

ED 208 885 IR 009 754

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TITLE Low-Cost Microtechnology Learning Aids in the Classroom. Discussion Paper 01/80.
INSTITUTION British Columbia Dept. of Education, Victoria. Information Service.; JEM Research, Victoria (British Columbia).
REPORT NO ISBN-0-7719-8316-6
PUB DATE Jun 80
NOTE 48p.; Prepared from a study conducted by William Goddard. For related documents, see IR 009 753-758 and IR 009 777.

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Autoinstructional Aids; *Calculators; Cost Effectiveness; Educational Media; *Electronic Equipment; *Equipment Evaluation; Foreign Countries; *Games
IDENTIFIERS *British Columbia

ABSTRACT

This study investigates the degree to which relatively low-cost microtechnology devices, e.g., electronic games and calculators, might be considered as aids to learning in the classroom situation. A brief discussion includes an overview of the research that has been done on the use of calculators as learning devices and examples of criticisms of calculator games as learning aids. A 29-item bibliography is provided, as well as a list of 69 low-cost microtechnology devices, including the trade name, manufacturer, supplier, retail price, and power requirements for each. Of these, three were removed because they were not aids, 28 were rejected because they had no perceived educational value, four were rejected because they had insufficient educational value to be considered for use in the schools, six were rejected because better devices to do the same task were available, and 22 were rejected because they were not available in Vancouver. DATAMAN, Sears 2001 Calculator, TI-30 Calculator, Spelling B, Speak and Spell, and Quiz Wiz, were selected as demonstrating some potential educational value. These six devices are listed with brief descriptions of their functions and the rejected devices are listed separately with the reason for rejection. (CHC)

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Province of British Columbia
Ministry of Education

DISCUSSION PAPER 01/80

LOW-COST MICROTECHNOLOGY LEARNING AIDS IN THE CLASSROOM

Prepared by Annette Wright
from a study conducted by Wm. Goddard for
Joint Educational Management Projects

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Joint Educational Management Projects

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Published February, 1980
Information Services
Reprinted June, 1980

IR009754

Canadian Cataloguing in Publication Data

Wright, Annette, 1943-

Low-cost microtechnology learning aids in the classroom.

(Discussion paper - Ministry of Education ; 01/80

"JEM Projects, Joint Educational Management Projects."

Bibliography: p.

ISBN 0-7719-8316-6

1. Computer-assisted instruction - British Columbia. 2. Calculating-machines. 3. Microcomputers. I. Goddard, William, 1933- II. British Columbia. Ministry of Education. Joint Educational Management Projects. III. Title. IV. Series: British Columbia. Ministry of Education. Discussion paper - Ministry of Education ; 01/80.

LB1028.5W74 371.3'9445'09711 C80-092053-8

DISCUSSION PAPER 01/80

LOW-COST MICROTECHNOLOGY LEARNING AIDS IN THE CLASSROOM

The following is a discussion paper which has evolved from the work presently being conducted by J.E.M. Projects on behalf of the Ministry of Education. Its purpose is to obtain reaction to the ideas presented.

We encourage you to complete, detach and mail this form to the J.E.M. Projects office, Discovery Park, Box 1700, Victoria, B.C., V8W 2Y2, or phone Dr. A. E. Wright, Research Director, J.E.M. Projects at (604) 477-7246.

Score along line and detach

Comments: _____

DISCUSSION PAPER 01/80

LOW-COST MICROTECHNOLOGY LEARNING AIDS IN THE CLASSROOM

INTRODUCTION

The material in this Discussion Paper is taken from a recent study undertaken by Joint Educational Management Projects on behalf of the Ministry of Education. The study was conducted by William Goddard.

The overall purpose of the project was to investigate the degree to which relatively low-cost micro-technology devices (electronic games, calculators) might be considered as aids to learning in the classroom situation.

The product of the investigation was a lengthy and comprehensive overview of readily available devices, research and discussion, including a sizeable amount of information which is undoubtedly of immediate interest to teachers.

Because many teachers would probably welcome some guidance on the utility of electronic games and calculators (indeed, one suspects that teachers are often asked by parents to comment on the educational value of such devices), the material in this paper has been selected for its practical value.....what is available, its limitations and possibilities and where to look for further information.

BACKGROUND

The need for a project to investigate the educational value of low-cost micro-technology games is evident to anyone who is aware of television advertising, press advertisments and the specialist stores which promote these devices. In much of the advertising, some 'educational' value is attributed by implication, to many of the games which utilise the new technology. Whether or not this is the case, requires large-scale research and testing. However, teachers must deal with this aspect of the 'computer revolution' right now; both because their students are acquiring these devices and because parents, in many cases, are looking to the schools to evaluate the educational benefits, or lack of them.

The term "low-cost" is defined as meaning a retail cost of less than one hundred dollars in Vancouver. The term "micro-technology learning aid" is defined as any device which uses micro logic circuits and which may appear upon first inspection to have some possible use as a learning aid.

THE CALCULATOR

> "What I fear is computer games becoming an obsession for children: teacher, playmate and best buddy rolled into one, solid state cell."
>
> "Fear not," says Roger C. Sharpe, games expert and author of Pinball! "Computers are the wave of the future. If these games can give kids an interaction with computers without scaring them, all to the good. It's just a question of getting a mix. My wife is pregnant. I'm going to buy the kid stuffed animals, then board games, then computer games. I don't think there will be a problem." (Jim Kaplan, in "Shopwalk", Sports Illustrated, May 1979).
>
> "Computer toys come closer to imitiating the style of human intelligence than the teaching machines of the past and may well represent the educational wave of the future." (Howard Gardner, Harvard Graduate School of Education, Psychology Today, p. 93, November 1979).

The quotations above represent the range of reaction to the wave of computer toys, games and "teaching aids" now available. There is very little research on those devices which may clearly be identified as toys and games. Gardner, in Psychology Today suggests that SIMON helps to train non-verbal memory and the PLAY AND PLAYBACK ORGAN helps foster the inventive use of intellect. More has been said on the subject of the 'updated teaching machines' such as SPEAK AND SPELL and QUIZ WIZ, and on the quasi-calculators such as DATA MAN and LITTLE PROFESSOR. A search of bibliographic sources (including ERIC) reveals only a smattering of research on special devices for the physically handicapped and masses of research on calculators.

A decision was made to begin this investigation with a closer look at calculators. The first reason for this is that electronic toys and games are the "offspring of calculators" (SILBERT). A pattern for investigation might be discovered by looking at calculator research. A glance at the bibliography which follows will show that much research has been devoted to calculators from the days of the early 'desk calculators', through the programmable 'mini calculators' to the new, affordable pocket calculators. The value of these devices has been quite well established

by research (eg. of forty recent studies 19 produced no significant results, 18 produced significant results in favour of the use of calculators and 3 produced significant results favouring non-use of calculators - Szetela 1979). The fact that calculator research must yet be done if conclusive results are to emerge provides a second reason for beginning an investigation of micro technology learning aids with the calculator. This is an especially poignant reason in the light of the reluctant acceptance of the calculator in many classrooms in spite of the permissive authorization of calculators by many ministries of education. If calculators are not yet 'established', how can their somewhat misbegotten offspring even be considered for legitimization?

Of course, any activity which teaches that intellectual reaction can be pleasurable may be valuable. However, as a topic for research it is somewhat nebulous. The research suggested by this investigation will concentrate on two rather more specific values which micro technology might provide; positive reinforcement for drill and practice, and encouragement to discover learning stragegies. The only use which might be considered for games such as "HOCKEY" or "MERLIN" is as a placebo for use with control groups. A box of popsicles might serve almost the same purpose.

A look at the preliminary list in section 3 will be enough to convince most educators that the development of micro electronic games and teaching aids is a bit disappointing. When one considers that many of these aids contain real computer "chips" which can do many things (compare them with micro-computers) it is evident that the manufacturers want to obtain $20 - $50 for <u>each</u> function their device will perform by making each device very specialized.

The manufacturers have also left themselves lots of room to make this years devices obsolete by next Christmas through 'upgrading' and 'improving'. The suppliers of the devices do not see much educational value in them and have even tried to discourage some zealous educators from buying class sets of games.

Many criticisms of these devices as learning aids could be cited; a few examples of comments are presented here. With reference to some of the calculator games it was observed that with a good book of games and activities one can do more with a standard four-function calculator. First, one can actually calculate an answer directly. Except for a few lights, many of these devices are only disguised calculators. A game such as CODE NAME SECTOR which appears to introduce the topics of compass bearings and the coordinate plane, behaves as though the diagonal of a square was the same length as one of its sides - a piece of misinformation even if one were not yet ready to introduce the concept of square roots. QUIZ KID SPELLER seems to teach nothing except the spelling of a few words in a book which even an average pre school child could master very quickly. Many participants in our trials wanted to know the cost of this game and felt that the spending of $24.99 could provide more learning and more fun.

The favourite games with children were; MERLIN (which plays six noisy games), SPEAK AND SPELL (which talks), SPELLING B (which provides a good variety of quiet games suitable for playing on long car trips), QUIZ WIZ (which provides 1001 interesting multiple choice questions on a variety of topics -- additional plug in modules of 1001 questions may be purchased at $8.88 each), DATA MAN (the best of the math games, can actually memorize parent or teacher questions for drill) and the better calculators (with books of interesting game activities such as Sid Sacksons CALCULATE).

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All who investigate low-cost micro technology learning aids must keep a few figures in mind to maintain their perspective. A class set of most "board games" costs less than $540. A class set of secondary school calculators cost less than $840. A class set of Speak and Spell costs less than $2,400. A small computer which can do all of the above and also display on a large T.V. screen costs less than $2,400. A good computer suppled with a microphone (so you can speak to it), a voice, a full colour graphics display, 200,000 computer bytes of memory, the ability to function as a full scale computer with graphs, cartoons (both input and output), full keyboard ninepart harmony (input and output) and a large assortment of teaching packages prepared by educational experts on curricular topics costs less than $9,000.

COMPUTER TOYS

The original proposal which led to the study was half-facetiously known as "computer toys". The findings of the six-months of investigation which went into the project as a whole tended to support this title. Only four devices (other than calculators) appeared to be anything but toys.

Nevertheless, the area deserves serious research and a number of British Columbians (Szetela, Dawson, Vance Sherril, and others) are in the forefront of investigations which will assist in the assessment of educational value as more and more of these devices come onto the market.

At the beginning of the investigation, a preliminary list of practical 'aids' was compiled as a basis for selection. This list is reproduced on the following pages.

PRELIMINARY LISTING OF AIDS (ALPHABETIC)

#	TRADE NAME	MANUFACTURER	SUPPLIERS	RETAIL
1	Alphie	Playskool	Sears	39.89
2	Amazatron	Coleco	Games People	41.50
			Good Stuff	41.50
			Sears	29.99
3	Basketball	Mattel	Good Stuff	40.00
			Games People	46.95
4	Code Name Sector	Parker	Games People	49.95
			Good Stuff	59.88
5	Comp IV	Milton Bradley	Games People	39.95
6	Computatune	Waddingtons	Games People	59.95
7	Computer Perfection	Lakeside	Games People	52.50
			Good Stuff	49.88
			Sears	35.99
8	Data Man *	Texas Instruments	Good Stuff	?
			Sears	22.99
			Willsons	26.95
9	Digital Baseball	Parker	Good Stuff	24.88
			Games People	22.50
10	Digits	Coleco	Good Stuff	29.88
			Games People	31.50
11.	Einstein	Castle	Sears	24.99
12	Electronic Battleships	Milton Bradley	Games People	62.50
			Good Stuff	64.00
			Sears	44.99
13	Electronic Mastermind	Invicta	Games People	40.95
			Good Stuff	49.00
14	Electronic Poker	Entex	Games People	79.95
15	Electronic Quarterback	Coleco	Good Stuff	44.00
			Games People	49.95
16	Football	Mattel	Good Stuff	42.00
			Games People	46.95

PRELIMINARY LISTING OF AIDS (ALPHABETIC) Cont'd.

#	TRADE NAME	MANUFACTURER	SUPPLIERS	RETAIL
17	Game Machine	Waddingtons	Games People Good Stuff	79.95 78.88
18	Head to Head Hockey	Entex	Games People Good Stuff	59.95 43.88
19	Hockey	Mattel	Games People Good Stuff	41.95 40.00
20	Intercept	Lakeside	Games People Good Stuff Sears	39.95 35.88 27.99
21	Laser	Logix	Sears	39.99
22	Little Genius *	Coleco	Good Stuff Games People	24.88 18.95
23	Little Professor *	Texas Instruments	Sears Willsons	17.99 19.95
24	Mind Boggler	Mattel	Good Stuff	40.00
25	Merlin *	Parker	Games People Good Stuff Sears	48.95 55.00 29.95
26	National Semi-Conductor 750	NSI	Sears	6.99
27	National Semi-Conductor *	NSI (800)	Sears	8.99
28	Pegs	Parker Brothers	Games People	21.95
29	Quiz Kid *	National Semi Cond.	Sears	9.99
30	Quiz Kid Racer *	National Semi Cond.	Sears	17.99
31	Quiz Wiz *	Coleco	Good Stuff Sears Games People	39.88 28.99 39.95
32	Scrabble Sensor	Selchow & Richter	Good Stuff	75.00

PRELIMINARY LISTING OF AIDS (ALPHABETIC) Cont'd.

#	TRADE NAME	MANUFACTURER	SUPPLIERS	RETAIL
33	Simon	Milton Bradley	Games People	55.95
			Good Stuff	55.00
34	Space Alert	Mattel	Good Stuff	40.00
			Games People	39.95
35	Speak & Spell *	Texas Instruments	Good Stuff	79.95
			Sears	?
			Willsons	89.95
36	Spelling B *	Texas Instruments	Willsons	49.95
37	Stop Thief	Parker Brothers	Games People	42.50
			Good Stuff	42.50
			Sears	29.99
38	Ten-in-one	Logix Cosmos	Good Stuff	12.88
39	Speller (Quiz Kid) *	National Semi Cond.	Sears	24.99
40	Zap	?	Games People	25.50
41	Zodiak	Coleco	Games People	79.95
			Good Stuff	74.88
			Sears	49.95
42	For use with above	Battery Eliminator	Good Stuff	15.00
			Games People	12.00
43	For use with above	Dynacharge		25.00
44	Other suitable inexpensive calculators		(a) TI 30 (bat.not inc.)	24.95
			* (b) Sears (bat. inc.)	17.67

LATE SUBMISSIONS (GAMES PEOPLE)

45	Conic	Conic	Games People	45.00
46	Football	Conic	Games People	39.95
47	Basketball	Conic	Games People	39.95

* Purchased for investigation.

PRELIMINARY LISTING OF AIDS (Cont'd)

Not found in Vancouver but reported in Consumer Reports, November 1979.

#	TRADE NAME	MANUFACTURER	RETAIL
48	Bandai Electronic Baseball	Bandai	9.00 (U.S.)
49	Entex 8001	Entex	45.00 "
50	Fonas Tri-1 T600	Fonas	35.00 "
51	Tiger Computer Baseball	Tiger	30.00 "
52	Head to Head Football	Coleco	31.00 "
53	Electronic Basketball	Bandai	9.00 "
54	Head to Head Basketball	Coleco	26.00 "
55	Auto Race	Mattel	25.00 "
56	Tiger Raceway	Tiger	30.00 "
57	Electronic Soccer	Mattel	27.00 "
58	Electronic Golf	Pulsonic	25.00 "
59	Epoch Math Master	Epoch	32.00 "
60	Tiger Think Tank	Tiger	10.00 "
61	Blackjack	Unisonic	20.00 "
62	Blackjack BJ-21	Enterprex	30.00 "
63	UFO Master Blaster	Bambino	35.00 "
64	Destroyer	Conic	27.00 "
65	Armor Battle	Mattel	25.00 "
66	Maniac	Ideal	45.00 "
67	Copy Cat	Tiger	18.00 "
68	Tiger Rocket Pinball	Tiger	30.00 "
69	Kingpin	Castle	20.00 "

PRELIMINARY LISTING OF AIDS - POWER REQUIREMENTS

#	BATTERUES REQUIRED	USES A/C ADAPTER?
1		
2	9 volt	Yes
3	9 volt	Yes
4	9 volt	Yes
5	9 volt	
6	2 - 9 volt	
7	2 - 9 volt	
8	9 volt	
9	2 - 'AA'	
10	9 volt	
11		
12	2 - 9 volt	Yes
13	2 - 'AA'	Yes
14	4 - 'AA' cells	
15	9 volt	
16	9 volt	Yes
17	6 - 'C' cell	Yes
18	4 - 'C' cell 3 - 'AA'	
19	9 volt	
20	9 volt	
21		
22	9 volt	
23	9 volt	
24	9 volt	
25	6 - 'AA'	Yes
26	9 volt	Yes
27	2500 HR	Yes
28	9 volt	
29	9 volt	
30	9 volt	
31	9 volt	Yes
32	9 volt	7 volt adapt. available
33	9 volt 2 - 'D' cells	
34	9 volt	
35	4 - 'C' cells	
36	9 volt	
37	9 volt	
38	3 - 'AA' cells	
39	4 - 'AA' cells	Yes
40	9 volt	
41	2 - 9 volt	Yes
42)	Usefullness depends	
43)	on specific aid-must	
44	be investigated for each.	
45		
46		
47		
48	9 volt	
49	3 - 'AA'	Yes
50	9 volt	
51	4 - 'AA'	
52	9 volt	
53	9 volt	
54	9 volt	
55	9 volt	
56	3 - "AA'	
57	9 volt	
58	9 volt	
59	2 - 'AA'	
60	9 volt	Yes
61	3 - 'AA'	Yes
62	3 - 'AA'	Yes
63	4 - 'AA'	Yes
64	3 - 'AA'	
65	9 volt	
66	4 - 'C' cell	
67	9 volt	
68	4 - 'AA'	
69	9 volt	

SELECTED AIDS

The preliminary list of electronic devices was narrowed from sixty-nine to six which might potentially be useful in schools. Two of the selected items were calculators.

Of the selected items, only the calculator has been the focus of systematic research. It has been demonstrated that the calculator can have a significant positive educational value in schools.

The list of selected aids follows.

from Preliminary List

8. DATAMAN (Sears $22.99, batteries - 15 hour life - $1.40, 9 - volt)
"The Story of Dataman" is a 24 page story book explaining operation and the following activities:

Answer checker - put in +, -, X, ÷ question, then = and your answer Dataman flashes light, if you are correct. If you are wrong Dataman provides the correct answer after displaying EEE.
After every 10 questions dataman displays the number of correct answers and the number of problems attempted.
Dataman will shut off automatically after 5 minutes if left unattended.

Memory Bank - up to 10 problems can be stored in the memory by a parent or teacher for drill on particularly difficult facts. Final score is shown with total time taken, and then a light display follows.

Starmath Race - a memory bank race against the clock between two competitors.

Electro flash - practice with +, -, X, ÷ tables - timed.

Number guesser - guess a random number between 9 and 100. - number of tries is shown in scoreboard.

Wipe out - 'hot potatoe' against a random time limit. Each participant in a group answers a question and passes dataman on. Losers drop out of the game.

Force out - take turns subtracting numbers. Loser is left with zero.

Missing number - box problems - player can move the ( ) to put answer where desired.

Combinations of the above constitute the games:

Orbit Math, First out, Spaceball, Astro race, Antimath maze.

27. Sears 2001 Calculator (four function) (Sears $17.67, 2500 hr. battery included. Extra batteries $4.50, G - 13 size Silver Oxide)

This calculator has an automatic shut off after 7 minutes. Leather carrying case for protection and holding instruction booklet. Display is 8 digit liquid crystal - large numbers are fairly readable. There is a single memory.

Keys:	CE/C,	OFF,	$\sqrt{X}$,	%,	MC
	7	8	9	÷	MR
	4	5	6	X	M-
	1	2	3	-	M+
	0	.	+/-	+	=

Keys are quite small with an adequate "touch" sense. This calculator is a better buy than the National Semi-conductor 800 as it has a stronger construction, longer battery life (2500 hrs. vs 18 hrs.) and batteries are included with the 2001.

44. TI-30 Calculator (Secondary Schools) ($24.95 - batteries extra $1.40) (A.C. adaptor available)

The TI-30 has an auto shut off and positive touch action.

Keys:	$1/x$	x^2	$\sqrt{x}$	OFF,	ON/C
	INV	SIN	COS	TAN	DRG
	K	EE	LOG	LNX	y^x
	π	%	(	)	÷
	STO	7	8	9	X
	RCL	4	5	6	-
	SUM	1	2	3	+
	EXC	0	.	+/-	=

39. SPELLING B (Willsons $49.95 - 9 volt extra, $1.40)
A silent spelling drill device with five different drills, Spelling B comes with a book of 264 pictures. It has a keyboard of the 26 letters of the alphabet and 13 other keys. It has an eight character display.

Spelling B - number appears on screen, user looks up picture with that number in the book and spells the word indicated. CLUE key gives next letter, ERASE allows corrections. User pushes ENTER when word is complete. Levels 1, 2, 3 (easy, medium, difficult words).

Starts with - same as Spelling B but user enters only first letter of word indicated in numbered picture.

Missing letter - a word (with some letters missing) appears on the screen, along with the number of allowed tries (starts at 5). Any letter guessed correctly appears in its proper place in the word. The letter does not appear if the guess is wrong and the number of tries is decremented. The CLUE key supplies one letter but decrements 2 tries. It has three LEVELS of difficulty.

Mystery word - similar to Hangman, the device displays dashes showing the number of letters needed in the word to be guessed, and the number of guesses allowed (starts at nine). A correctly guessed letter appears in its proper place in the word. An incorrect guess decrements the number of guesses remaining. CLUE provides one letter at the cost of two guesses. There are three LEVELS.

Scramble - one player enters a secret word by pressing the MEMORY key. The device displays a scrambled version and a second player tries to "unscramble" the word by typing the letters in the correct order. CLUE can be used to get the next letter. ERASE can be used to correct the attempt before it is ENTERed.

35. SPEAK & SPELL (Goodstuff $79.95 - 4 C 'Cell batteries)
Speak & Spell has five different drills. It has a keyboard with the 26 letters of the alphabet and 14 other keys. It has a display of eight characters and a speaker which plays three four-note tunes, and "says" letters as they are pressed and messages such as "that is correct, now spell (word)", "that is incorrect, the correct spelling of (word) is -------."

Spell - the machine says "Spell (word)". The user presses the keys needed to spell the word and the device says each letter as it is pressed. The user may press ERASE to start the word over. When it is as the user wants it, he presses ENTER and the word in evaluated. If incorrect, the machine says "Wrong, try again, (word)" and the user gets a second chance. If it is entered wrong a second time, the device says "That is incorrect, the correct spelling of (word) is -------." If the user spells the word correctly, the message "That is correct. Now spell (next word)". At the end of ten words the machine displays and says the score. The REPEAT key can be pressed to have the machine re-say the current word. REPLAY causes the same ten words to be presented again. There are four levels of difficulty of words; the machine contains 200 words in all and extra modules of 200 words can be inserted.

Say It - the device presents a word or the display, says "say it", pause, and then says the word - for 10 words. Then the user is asked to spell these ten words as in the Spell game.

Mystery Word - the same as Mystery Word on Spelling B.

Secret Code - a word can be entered; the machine transforms it into a code. This code, entered in the same way is 'coded' back to the original word.

Letter - generates a random letter of the alphabet.

Spelling B and Speak & Spell are equally useful in different ways.

31. QUIZ WIZ (Sears $24.99 - 9 volt battery $1.40)

14 Additional sets of 1001 questions and answer module are available at $8.88 each. A/C adaptor is also available

Keys:	1	2	3	A	B	YES	NO
	4	5	6	C	D	Light	Light
	7	8	9	ANSWER			
		0		CLEAR		OFF	ON

User:
1. Pushes clear
2. Types question number (from booklet)
3. Pushes multiple choice key
4. Presses answer key.

Right answer - green light, high tone sounds

Wrong answer - red light, low tone sounds

Repeat 1 - 4 for each question.

Questions are in both English and French, each 'module' comes with a chip mounted on a carrying case and a book of 1001 questions (French drill could be done by removing English portion).

e.g. 1. Quel nombre complète la série suivante?

1. What number comes next in the following series?

9, 5, 8, 14, 10, 13

A. 7 B. 19 C. 23 D. 9

e.g.689 Michel Ange fut considéré comme étant le plus grand _____.

689 Michalangelo was considered the world's greatest _____.

A. nageur B. coureur C. plongeur D. peintre

A. swimmer B. runner C. diver D. artist

Modules available include: General, Sports, Trivia, Movies & T.V., Math, Lists, Sports Legends, Super Heroes, Disaster, The Ocean, Energy, How things work.

** Teachers can make up their own multiple choice questions on any topic so long as the correct answers match one of the module chips.

At the outset it was not anticipated that such a large number of electronic devices would be found. Sixty-one devices were rejected for the reasons listed below:

No Educational Value. Most of the devices examined were sold as toys, with no intended educational value. The following devices, in the experimenter's opinion, have no useful application in the current B.C. curriculum:

#	From preliminary list:
2.	Amazatron - 8 maze games
3.	Basketball (Mattel)
5.	Comp IV - a form of Mastermind
6.	Computatune - memorizes tunes and tempos
7.	Computer perfection - memorizes a sequence of digits
9.	Digital Basketball (Parker)
10.	Digits - a form of Mastermind using digits
11.	Einstein - remembers a sequence of notes
12.	Electronic Battleships - like Code Name Sector, 2 players
13.	Electronic Mastermind /plot courses
14.	Electronic Poker
15.	Electronic Quarterback (Coleco)
16.	Football (Mattel)
17.	Game Machine - overlays for blackjack,mastermind,car race,
18.	Head to Head Hockey (Entex) /shooting gallery
19.	Hockey (Mattel)
20.	Intercept - battleships and bases are attacked
21.	Laser - hit moving light target with laser gun
24.	Mind Boggler - guess a number
25.	Merlin - tic-tac-toe, tunes, echo, blackjack (13), magic square, mastermind
28.	Pegs - matching game
32.	Scrabble Sensor - like Mastermind with words
34.	Space Alert - like Battleships

37. Stop Thief - electronic 'clue'
40. Zap - pong game
41. Zodiac - horoscope
46. Football (Conic)
47. Basketball (Conic)

Insufficient Educational Value. The following devices, while offered for sale as "educational" devices, or having some apparent educational value, were nonetheless judged inadequate for use in B.C. schools at this time:

1. Alphie - how many objects in a picture
4. Code Name Sector - plot a course and sink a submarine
33. Simon - memorizing sequences of lights and tones
38. Ten-in-one - teaches simple electricity

Inferior. The following devices, while having educational value and possible application in schools, were rejected because (considering price) better devices to do equivalent tasks were available:

22. Little Genius - Drill on 4 arithmetic operations
23. Little Professor - Drill on 4 arithmetic operations
26. Calculator (National Semi conductor - $6.99) - 6 digit calculator
27. Calculator (National Semi conductor 800 - $8.99) - 8 digit calculator
30. Quiz Kid Racer - timed math drill
39. Quiz Kid Speller - spell words depicted in picture book

Not Available. The following devices were not available in Vancouver and were not examined:

48. Bandai - low skill baseball game
49. Entex - Baseball
50. Fonas TRI-1 T600 - 3 Baseball games.
51. Tiger Computer Baseball (Tiger)
52. Head to Head Football (Coleco)

53. Electronic Basketball (Bandai)
54. Head to Head Basketball (Coleco)
55. Auto Race (Mattel)
56. Tiger Race Way (Autorace)
57. Electronic Soccer (Mattel)
58. Electronic Golf (Pulsonic)
59. Epoch Math Master - Arithmetic drill
60. Tiger Think Tank - Like mastermind
61. Blackjack (Unisonic)
62. Blackjack BJ-21 (Enterprex)
63. UFO Master Blaster (Bambino) Target game
64. Destroyer - Target game
65. Armor Battle - Target game
66. Maniac - Like Simon
67. Copycat - Like Simon
68. Tiger Rocket Pinball - Pinball machine
69. Kingpin (Castle) - Kingpins

COMMENTS

Considering the large variety of low-cost micro technology devices available and what could be done with them, the results of the analysis are disappointing. Very few of the devices have any direct and useful educational value.

The most useful device that has been produced by the significant micro technology advances so far, is the low-cost calculator. Calculators are now available at a cost which makes them easily affordable by every member of society - including children. A considerable amount of school time during grades two through eight is devoted to making students fluent in arithmetic; and calculators affect, at the most fundamental level, the way in which everyone does (and perceives) arithmetic. Calculators are not a fad; they are already a part of our culture. It seems desireable then that they be integrated into our arithmetic curriculum in the most useful manner (educationally) and at the earliest possible date.

Two devices, which were rejected, deserve some additional comment because of their motivational value, these are MERLIN and SIMON. MERLIN is a device about 12 inches long and 4 inches square. It has twelve 'keys' which can be 'off', 'lit', or 'flashing', and four selector keys. It has a speaker which can produce twelve musical tones and a buzz. The user can select one of six games: tic-tac-toe, music composition, tune echo, blackjack (to 13), magic squares, and secret number.

SIMON has four coloured sectors, arranged in a circle. Each sector is associated with a musical tone. There are three basic games that can be played with SIMON; all involve the user remembering sequences of colour/tone elements and repeating them. The sequences can be as long as thirty one elements. Both of these devices are attractive and well-constructed. They are distinguished because children find them fascinating to play with. Their use involves various kinds of mental activity in games which you either play against yourself or against the machine. There is no doubt that children (or adults) who play these games learn something and develop special skills. However, what is learned is not part of current B.C. curriculum.

ACTIVITIES WITH THE CALCULATOR

The literature contains an abundance of activities suitable for use with the calculator.

In particular, sources of activities include: The Calculator Workbox (Sharp, 1973), Calculator Activities for the Classroom, (Vervoort and Mason, 1977), Keystrokes (Reys et al, 1979) and The Calculator Book (Imerzeal and Ockenga, 1979).

An example provided by Szetela,(1978, 1979) suggests that calculator usage be based on realistic data such as lengths and widths of automobiles. The calculator may then be used to determine the ratio of car width to car length, expressed as a decimal correct to hundreths.

SUMMARY

During the course of the investigation, sixty-nine devices were identified and initially categorized as low-cost, micro-technology learning aids. Of these, three were removed because they were not aids, twenty eight were rejected because they had no perceived educational value, four were rejected because they had insufficient educational value to be considered for use in the schools, six were rejected because better devices to do the same task were available and twenty two were rejected because they were not available in Vancouver.

Six devices were selected as demonstrating some potential educational value. These were:

DATAMAN (Texas Instruments), $22.99 at Sears
Sears 2001 Calculator (National Semiconductor) $17.67 at Sears
TI-30 Calculator (Texas Instruments) $24.95 at Sears
Spelling B (Texas Instruments) $49.95 at Willson Office Specialty Ltd.
Speak and Spell (Texas Instruments) $79.95 at Good Stuff Games
Quiz Wiz (Coleco) $28.99 at Sears.

Some consideration was given to the likely usages of these devices in the schools. It is suggested that activities could be applied to the following levels; in keeping with the curriculum requirements:

DATAMAN
Grades 2-4 and at the grade 8/9 level in a Learning Assistance Centre.

SEARS 2001 Calculator
Grades 5,8

TI-30 CALCULATOR
Grade 11 Trigonometry

SPEAK & SPELL/SPELLING B
Grades 2 to 4
Grades 8/9 Learning Assistance Centre
English as a Second Language

QUIZ WIZ
Grade 8/11 Social Studies